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JOCM
18,2

The changing nature of work in the age of e-business

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Abstract

Purpose – This paper reviews recent discussions in the information technology (IT) and management literatures in order to consider their implications and to make a series of predictions about organizational life in the coming e-business era.

Design/methodology/approach – A wide variety of recent discussions, ranging from comments by political/governmental figures to scholarly reports in the academic literature, are reviewed to consider their implications for the structure and shape of jobs and the job market.

Findings – The review provides evidence that developments in IT suggest that significant levels of job loss will occur in routine jobs, coupled with a pronounced movement towards a job market of flexible, fluid groups of highly-skilled, entrepreneurial, consultant-like employees.

Practical implications – Should this transition take place, there will be little place in the coming workforce for low-skilled employees and a significant decrease in the overall size of the workforce. The jobs which remain will be those, which by their very nature, are creative and cannot be automated. Managers, governmental policy makers and the workforce in general will need to consider these implications.

Originality/value – Discussion and debate of the prospects need to begin immediately. This paper represents an effort to begin this process.

Keywords Work design, Internet, Knowledge management, Change management, Electronic commerce

Paper type Conceptual paper

The current job market

Work has radically changed with the infusion of new technologies. An example of this is Verizon's call center voice operators. The operator on the other end of the phone is polite, curious, remembers where you left off if your call was interrupted, and can check your telephone line on the spot (Anthes, 2004). If the problem cannot be fixed on the phone, a technician is scheduled and dispatched. Technology enables all of these services to be handled in one call without the customer being forwarded from department to department. There is only one catch; the operator on the phone is not a person. It is an intelligent speech recognition application that can communicate in plain conversational text and is much more advanced than the standard "press or say 1" voice response units (VRU). Verizon is not the only company employing these technologies that are replacing jobs with technology. In 2004, AAA of Minnesota reported that they had reassigned 20 percent of their call center using intelligent VRU technology, saving \$2 per call and \$200,000 per year.

This type of job replacement is not limited to 2004 technologies. In the fall of 2003, newspaper headlines reported that the US has experienced a steady loss of jobs over a seven-month period, culminating in a loss of 93,000 jobs in August 2003 (Zuckerman, 2003). While the job market showed some signs of recovery in the last quarter of 2003, economists continued to find it difficult to reconcile economic growth with lower job numbers by January 2004 (Uchitelle, 2004). Studies have shown that, while new jobs opened up in 2004, the wage gap between high- and low-paying jobs widened, and



Journal of Organizational Change
Management
Vol. 18 No. 2, 2005
pp. 132-144
© Emerald Group Publishing Limited
0953-4814
DOI 10.1108/0953481051058961



many jobs were not being replaced (Wessel, 2004). Especially troubling was the recognition that losses have continued to occur during a period when the economy has been making gains as reflected in statements such as that of a Federal Reserve Board Governor "I admit that I don't fully understand the sources of this conservative behavior on the part of company management, and for that reason, I cannot be entirely confident that caution will not continue to predominate in the executive suite." (The Federal Reserve Board, 2003).

In contrast to such temporary loss perspectives, Groshen and Potter (2003) have proposed that permanent shifts in the nature of work throughout the economy have caused this economic recovery to produce job losses rather than gains. In an examination of previous recessions, they show that, where there is no structural change in the economic system, employers will quickly re-hire employees to previously-existing positions when the economy recovers, but if there are structural changes, the new jobs needed when the economy expands again are so different from the pre-existing jobs that neither employers nor employees are ready for re-hiring.

This paper focuses on the impact of pervasive information technology (IT), which we will define below, on the jobs available in an organization in the era of electronic business (e-business), and suggests that technological shifts may be bringing about structural change. If this is the case, what we may be observing, as businesses do not re-hire, is not caution, but rather the recognition by business that workers in certain kinds of jobs are simply no longer needed. We suggest the possibility that what the executive suite is really saying is that much of the old workforce is no longer required to support productivity gains, and a different set of skills are necessary to utilize the new technology effectively. While current workers are not prepared for these new jobs, employers are also likely unaware of what skills are necessary for the coming jobs, and even what these jobs may be. Moreover, is it possible that job loss will continue and even accelerate in the future? Are the types of productivity gains through the intensive use of IT documented in studies (Stiroh, 2001) the reason for this job loss with growth? This paper explores these possibilities from the perspective of the pervasive information age.

The age of the information-empowered employee

Structural change

Over the last 30 years we have moved from an industrial society to an information society. Note that for purposes of this discussion, the aspects of the industrial revolution and the creation of an industrial society, which will be examined are those dating from the early 1700s to the period immediately after World War II (note, however, that Bell (1976), Wren (1979), and others recognize that the industrial revolution itself had its origins considerably earlier). With the dawn of the computer era following the war, there has been an accelerating shift to an information-based society and we have seen the dawn of the information age. Daniel Bell (1976) was among the first to note this shift from manufacturing to services, the growing importance of knowledge and "science-based" businesses, and the increasing power of "technical elites" in a post-industrial society. Common to both the industrial revolution and the information revolution is a massive introduction of technology. During the industrial revolution, there were periods of extremely high technology infusion and, in the context of our previous discussion, structural change. The steam engine and the locomotive are seen by Drucker (1999) as two industrial-revolution technologies that

drastically changed the way the world worked. What is new about the infusion of technology in the Information Age as compared to the industrial age is its focus. Industrial-age technology focused on products as the output. Information-age technology focuses on information as the output.

Electronic commerce (e-commerce) has been defined as business that is conducted over the internet using any of the applications that rely on the internet (*Webopedia*, 2004). The broader term of e-business applies to businesses that make significant use of applications that rely on electronic network-based technologies. These technologies include e-mail, instant messaging, online shopping carts, XML-based communications, web services, wireless LAN connectivity, and embedded devices. Collectively, these technologies connect employees, partners, and customers to one another anytime, anyplace and create a computer-mediated communications (CMC) environment that breaks down traditional geographic limitations. CMC is any communication where the computer is the medium for conversation and has recently been considered an alternative to face-to-face communications. During the current period of rapid change, the initial e-commerce boom has faded and many of the dot-coms have folded, but e-business – which, for purposes of our discussion, centers upon the use of pervasive IT to manage the firm – has remained. Thus, the shift appears to be from e-commerce, rather narrowly defined as the buying and selling of goods and services electronically, to the broader sense of e-business and to the use of information technologies, and the internet in particular, to change the enterprise and adapt to a rapidly-evolving technology.

The information-empowered employee, whom we will term the IE-employee, is one who has access to corporate and relevant external information via the network at all times, and is involved in supporting business processes permeated by IT. This employee will transact and manage business processes through integrated information systems. These systems will extend beyond single business entities and typically span the value chain. Access to these systems will be via pervasive computing technologies. A pervasive computing system is defined as one that offers secure, robust, real-time, seamless universal access to data via a wide array of devices (NIST, 2002). Pervasive computing puts computing power in the hands of all employees, available wherever it is needed. Integrated information systems offer seamless data and process integration over diverse information systems. IE-employees can access data, obtain relevant information, and tap into stored knowledge to complete their tasks.

Redefining work

Are the concepts of jobs and work in transition? Bridges (1994) points out that the traditional job concept is, in reality, quite recent. It was created during the onset of the industrial revolution to provide the human capacities needed to feed the factories. Producing a standardized product as efficiently as possible was the primary concern, and under Taylor (1911), in his *Principles of Scientific Management*, the emphasis was upon finding the one best way to perform every segment of a fragmented, routinized job. The creation of the job brought about a profound change on how society lived and worked. In a move away from family work circles and trades that were passed down from one generation to another, formal training in standard procedures was created. Under scientific management, it is important to note that not only are procedures to be done in a standard, one-best-way format, but also that the job itself becomes narrow and is only a part of the total process – an idea exemplified by the assembly line (Wren, 1979).

Participation by and empowerment of workers was discouraged under scientific management. Wirth (1992) discusses the idea that, while we in this country have lived in a democratic society, democracy has had no place in the traditional American workplace. The modern factory and many lower-level clerical jobs are based on a fixed time schedule, strict division of labor, and close supervision. In the service sector, many businesses have applied the principles of scientific management to improve productivity and to permit the employment of low-skilled employees. The hamburger flippers of the industrialized service sector are managed like their factory counterparts. Thus the American work force has continued to be run for the most part in the same way as advocated by Taylor (1911) and scientific management. In an era of pervasive IT, will close supervision become a thing of the past? While proponents of e-business have suggested that work would enter a utopian era with low central control, in reality IT has permitted managers to use a higher degree of micro-management over wider spans of control. Is a dual system dominated by a "technical elite" as noted by Bell (1976) emerging, with some jobs that are intensely monitored using technological tools, while other newly-created jobs allow significant creative freedom? Today's lower-level job will be eliminated and replaced by a much smaller number of more-intensely-monitored jobs.

The new job and the new process of managing

Moreover, the new creative jobs that will open up are likely to require significantly more skills and very different abilities. In a knowledge-based era, work cannot be designed in a cookie-cutter function, with prescribed, interlocking pieces, and there may be no preconceived notion of how to complete the work. Furthermore, managers in traditional jobs knew more about the job than their employees. In the future, the highly specialized employee doing work, which is not well defined will know more about the job than the manager. Owing to the fact that more jobs will be knowledge jobs, and the ability to interact with and even modify some aspect of a complex information system will be required, most managers will be less competent in the job than their employees. Unlike the factory setting where managers by virtue of seniority and prior education knew more about the job than the employees, the new manager is likely to know less about the job than the employee, and function in a more democratic setting. Additionally, since managers will know less about highly specialized tasks than their skilled employees, they will lack the ability to engineer the one best way to do work (Adar, 2002; Bridges, 1994; Drucker, 1999; Wirth, 1992). Moreover, it seems likely that such new jobs cannot be designed, evaluated, or even managed using traditional management techniques, since they are not jobs in the traditional sense. Instead, under this new notion of the job, each employee may have his or her own way to complete the work and workers may resist autocratic management attempts to control what is being done (Adar, 2002). Note also that such changes should lead to corresponding changes in traditional employee education, with less emphasis on teaching facts and rules that are necessary for the workplace and more emphasis on providing the foundation for stimulating ideas for creative problem solving.

Job eliminations

Well-defined jobs of the factory era can all potentially be automated in a highly-integrated, IT-intensive environment. This movement toward automation applies not only to jobs requiring physical tasks but mental tasks as well. In fact, since the computer is well-suited to number-crunching, decision analysis, and with

improvements in intelligent technologies such as neural networks and pattern recognition, if it is possible to clearly define what is to be done and map the business process thoroughly, over time, the process can be completely automated, leading to the elimination of the job itself. Note that this phenomenon is well underway not only in the case of the automated assembly line but also in such defined service-sector jobs as telephone operator, service station attendant, grocery cashier, and bank teller. Moreover, most administrative jobs typically involve handling information, and all such positions are impacted by integrated information systems and ubiquitous access to information. The jobs involved in purchasing, payroll processing, benefits planning, and accounting are only a few of the job types that will be impacted by – and potentially eliminated by – technology. Many customer-contact jobs are changed by pervasive technologies as well. Jobs from airline ticket reservations to industrial sales and customer support will change and most appear likely to be eliminated. David (1990), in his classic article on the need to adopt structural changes in the enterprise to internalize the effect of IT, showed that many existing tasks would have to change completely before there would be real productivity gains from IT. From this perspective, a large part of the reason for the current jobless recovery is that improvements in business processes enabled by pervasive IT have eliminated jobs and significantly altered the remaining positions.

The rise of the creative class

As the well-defined jobs are eliminated, the jobs that will continue to be done by humans will be those that cannot be automated, precisely because they are not well defined and cannot be well defined. Design and research activities, as well as tasks requiring a high degree of human contact, are examples of this sort of work. Moreover, there is recognition that a growing number of more influential members of the workforce, whom Florida (2002) terms the creative class, create much of the wealth in the economy. He estimates this group to be composed not only of IT employees but of managers, writers, and many others whose work primarily entails use of information, and proposes that these employees are members of a nearly 40 million-strong group that give the economy much of its momentum. While employees in the service class outnumber this group, and are estimated by Florida to number about 55 million, he argues that economic growth is dependent upon effectively managing the creative class.

In turn, the advent of a creative-class workforce may call for a revisiting of participation and empowerment as constructs. Note that, in traditional terms, we would describe the emerging new creative-class jobs as empowered. But empowerment may not necessarily be the right answer for the new employee and job. Many people do not want what they perceive as more work for the same pay. In Mintzberg's (1998) terms, people in the 21st century want to be challenged and inspired but not necessarily empowered, especially if empowerment is a code word for increasing responsibility without a commensurate increase in rewards. Given this caveat, could the principles of empowerment serve as the basis for designing and managing jobs in the information era? This is probably doubtful. In the pervasive-information-age job, workers in the categories described, may very well be more likely to expect full control over job-related decisions, rather than mere participation.

However, while the employee will maintain control over the job, and not follow strict guidelines provided by managers, this does not mean that the job will be defined entirely by the employee. Ubiquitous computing allows the employee to link to the

workplace anytime, anyplace. Potentially, then, such linkages mean that the job will follow the employee wherever he or she goes. In today's terms, we observe that a healthcare professional on call can be reached by patients and those needing service not just at the office, but at home, and even on vacation. Hence, we may see a situation emerge, where the nature of the job, the work required for the job, and perhaps the customer or stakeholder – including both external customers and internal organizational ones – will define the work hours, and not the manager. Ubiquitous computing and integrated information systems may well stretch out, rather than shrink, job hours, and the strict defining line between work and home may be obliterated. Supporting this line of argument, Roach (1998) has argued that much of the gain in productivity documented from the use of IT is not real, and is the result of miscalculation of labor input. He argues that in the industrial era, with defined workplaces and union rules, work hours were strictly calculated, while in the amorphous workplace of the IT era, employees put in many hours while traveling, at home, and even on vacation that do not figure into the calculations of productivity. Thus some of the recent productivity gains may be occurring as a result of undervalued work hours.

Moreover, this lack of definition between work and non-work potentially creates a need for transitions between work and home roles, and can complicate both facets of employee life. Ashforth *et al.* (2000) discuss the need for role exit and rites of separation to support this transitioning. In the IT-enabled seamless world, where work and play interact continually, there may be a new need for business training to help employees distinguish among these states through appropriate rites of separation. Compounding the tension is the recognition that today's employees want a balance between personal and work lives as a critical component of job satisfaction.

Implications for managers and management

Mintzberg (1998) has suggested that a shift to expertise on the part of the employee rather than the manager will mean that managers will need to adapt to a new role, more similar to that of an orchestra conductor rather than a shift supervisor, straw boss, or even coach, the role that some recent theorists have prescribed for managers (Whetton and Cameron, 1998). Others (Bridges, 1994; Drucker, 1999) have suggested that most, or even all, management jobs, especially at the middle-management level, will eventually disappear. Potentially first to be eliminated will be those managerial jobs whose primary function is to move information through a chain of command. Moreover, from this perspective, the traditional manager will no longer be needed by specialist employees who have control over their jobs and function more like outside consultants with expertise in their areas than employees in the traditional sense. Those managerial jobs that remain may have an extremely broad span of control. Historically, Wren (1979) notes that the appropriate span of control has been fairly narrow, at roughly seven to ten employees to one supervisor. Management theorists were intrigued when, for example, findings from the King Tut excavations revealed that the ancient Egyptians adhered to this formula. But an enhanced ability to review meaningful data from many workers in a real-time context may mean that the manager can effectively supervise many more employees than has previously been considered possible. Reflecting the perspective of consulting firm McKinsey, Byrne (2000) points out that technology has allowed Bank of America to manage a \$700 billion bank as effectively as it once managed a \$7 billion bank.

Alternatively, however, contingency theorists have pointed out that the number of people supervised should be related to the complexity of the work, with those who are supervising complex tasks supervising fewer workers. From a theoretical perspective, Van Fleet (1983) has listed seven factors determining the appropriate span of control. Of these, job complexity and coordination complexity appear related to the new job and the new managerial demands as we have discussed them and are seen by Van Fleet as reducing the span of control.

Will the need for more supervision in the case of complexity become the rule in the pervasive information age? A clear pattern has not yet emerged. Studies have noted that changes in the span of control vary by industry (Davison, 2003), and have found a flattening of the firm's structure, suggesting a broader span of control (Rajan and Wulf, 2003). Note, moreover, that the Van Fleet perspective assumes that the manager is needed to understand and coordinate the job, while the discussion to this point has suggested that managers may not be needed for either function. Additionally, in Van Fleet's analysis, job similarity, employee proximity, employee ability, employee empowerment, and management ability increase the span of control, and given the level of employee job control suggested, at least the empowerment feature also argues for a broader span of control, because the jobs that remain, or evolve from the pervasive system, are highly dissimilar and not controlled by the manager. As noted, in a closely linked information system, routine queries and reports are automatically generated and best-practice business processes are embedded in the system. Specialized and autonomous employees may be needed to discover new patterns in data, improve processes, or handle exceptions to established rules. Overall, with the associated increase in employee autonomy and expertise, there may be a lowered need for supervision. A guarded guess at this point is that span of control will increase, possibly radically, and that this increase will further reduce the need for traditional managers.

The work of the information-empowered employee

Drucker (1957) in his groundbreaking *Landmarks of Tomorrow* defined innovation as the systematic, organized leap into the unknown. The shape and feel of jobs of the future represent one such unknown, and at best we can consider the possibilities, which have been suggested. Zuboff (1984) finds that organizations use one of two approaches as work processes are changed and augmented by technology, leading to the idea that work can either be automated or informed. Automated systems simply involve replacing manual tasks with computer processes. Informing involves creating systems that process knowledge and share it within the organization using new techniques. As Drucker (1999) recently pointed out, the real transformations brought about by technological innovation are not simply permitting existing activities and functions to be performed more rapidly or efficiently, but rather meaningful transformation occurs when the processes themselves become different and, for both Drucker as well as for Thurow (1999), when the functioning of the economic system as a whole is transformed. Transformations of this type took place during the industrial revolution with the development of the steam engine and the locomotive. Equivalent transformations during the information revolution include the development of e-commerce, with the addition of e-commerce to traditional brick-and-mortar organizations as well as, in a broader sense, the development of e-business, as the shape and management of the entire organization is radically

transformed. The networked organization, which achieves competitive advantage by outsourcing all of its non-core business processes, is an example of e-business implementation that will transform the economic landscape (Byrne, 2000).

Drucker (1957) pointed out that automation, as the rapid substitution of work by knowledge and concept for work by human hands, is a first impact of the educated society, raising the prospect that as society became more educated, workers would be less likely to want physical labor jobs. In the society envisioned by Drucker, the only real capital is knowledge. Knowledge organizations are different from traditional organizations in that innovations are the most important input and human intellect is the most important capital (Adar, 2002). What is suggested is that, as the 21st century dawns, labor-intensive operations will diminish and fewer people will be required to maintain the same level of outputs.

For managers, issues of appropriate supervision and pay treatment for the new work can potentially become acute. Studies have documented an average wage gain of 13.5 percent for employees using IT and have also shown that low-technology companies pay a higher premium for technology-savvy employees than do high-technology companies (Goss and Phillips, 2002). As more organizations become more sophisticated along technological lines, will pay of skilled workers go down? What about fragmented jobs? Pay treatment for a specialist who performs a vitally needed function for 12 hours a week is the sort of problem, which may be posed. Does this transition lead to high technology, Taylor-style (Taylor, 1911), piece-rate systems, where employees bill for specific tasks? We see this trend in many industries, ranging from hospital billings which charge for every bar-code-scanned employee action to billings by law firms which list charges for every telephone call made on behalf of a client.

De-skilling and up-skilling

Moreover, as noted, not everyone will be a beneficiary of the changes we envision. Wirth (1992), points out that technology, can either de-skill or up-skill jobs. He suggests that any time you enter a fast food restaurant, you observe de-skilling taking place. But will these de-skilled jobs continue to exist, or will they too be automated over time? In the service industry, to this point, many of the de-skilled jobs have not been automated due to technical limitations of robotic equipment, which have made flipping hamburgers or filling tacos a challenge for current robotics technology. In the case of clerical and administrative jobs, however, once the data is available via the network, and the business processes are integrated and built on the information system, it is the human employee who becomes superfluous, and whose very presence in the process leads to delays and errors. The same phenomenon has occurred when large enterprise systems have been implemented, enforcing externally-developed industry best practices in organizations. Over time, as the new processes are accepted in the enterprise, the de-skilled jobs are eliminated. Call centers have used expert support systems – large computer programs and databases, which recommend the correct advice for a problem – to permit low-skilled employees to provide technical advice. However, the jobs are transitory, and will be eliminated as customers can input the problems over the web, and sensors start reporting problems automatically to the help site. Under this scenario, the only help jobs that will exist will be those, which handle truly difficult problems that do not have canned responses. At the same time there are challenging jobs that should arise, in the area of IT and in the specific business, to manage updates to this system, monitor for security, and handle exceptions. However,

the skills required by these new jobs are unlikely to match the abilities of de-skilled employees whose jobs are being eliminated. Of course, given the previous analysis, it may well be that even these de-skilled jobs will disappear. Regardless, the initial problem presented for the future of the American workforce will be justifying the pay and reward differences between the high-skill and low-skill workforces and dealing with the technological haves and have-nots.

What about the possibility – and perhaps likelihood – of structural changes, where the nature of remaining jobs also changes? There are many areas such as automobile design, medicine, or even plumbing where technology is requiring more skills. As manufacturers begin offering custom-designed automobiles, new positions will be created for personal designers – just as has occurred as the traditional airline reservation system has been automated, jobs have been eliminated, while new positions have opened up in vacation planning. Genomics presents the possibility of individualized medical care, driven by detailed information, with specialized applications accessing a vast array of analytical tools. Coile (2001) offers the prospect of a high-technology healthcare system, where the physician is needed to facilitate the delivery of the technology-based solution. One argument that can be made is that high-technology systems need more skills to be managed effectively. Since such skills are often in short supply, technology often comes up with the solution, offering a standardized service that replaces workers with equipment (labor with capital), and reduces the need for purely technically skilled employees. When technical needs decrease, a need may arise for humans to be customer-focused touch-points to counteract the numbing, insensitive feel of high technology, and organizations may search for employees with human skills rather than purely technical personnel. In effect much of the need may be for technology-savvy employees who retain the human touch rather than for highly-skilled personnel who focus only on the technology. This direction may especially be true in customer-centric services like healthcare.

The impact of the information age on the organization

The traditional, hierarchical organization chart was a product of classical management theory and especially that of Fayol (1916). Following the prevalent thinking during this period, Fayol, who was a near contemporary of Fredrick W. Taylor, argued that there was one best way to organize. Departmentation was to be by function, and movement up the hierarchy would be slow but based upon competence and expertise. Communication would be through the chain of command, or what Fayol referred to as the scalar chain. Authority was to be centralized at the top of the organization. By the mid-1960s, theorists such as Burns and Stalker (1961) and Woodward (1965) recognized that the one best way did not hold for all organizations under all situations, and contingency theory was born. Classical organizations produced efficiency but were cumbersome at best and slow to react. They were seen as best for stable environmental conditions (Burns and Stalker) or, where the shop floor technology was mass production (Woodward). As the environment became unstable or where the technology was job-shop or continuous production, a move to a more free-flowing form, described as organic, was needed. While there was agreement that this form would be more decentralized, and less hierarchical, no single organic form emerged. Initial emphasis was upon departmentation by product or territory rather than by function, a form providing the individual departments with more autonomy than the functional form provided. Malone (2004) focuses on the rapidly falling cost of communication, and

argues that the economic and scale efficiencies of large organizations, and the human benefits of small ones, can be achieved at the same time. He argues that low cost and pervasive communication technologies will support four decentralized organization structures: loose hierarchies, democracies, external markets, and internal markets that will shift management from “command and control” to “co-ordinate and cultivate”.

There have been efforts as well to create more temporary units through project teams or matrix organizations to provide more responsiveness, and often such units are dispersed geographically. IT is used to support teams that may not be co-located, and virtual teams are created to support specialized business projects. CMC supports virtual teams and allows global cooperation. One essential question that needs to be answered is the degree of long-term trust that is created in virtual teams and organizations depending on these teams. A study of trust in virtual teams (Piccoli and Ives, 2003) shows that in virtual teams and other CMC environments there can be a decline in trust because of the higher levels of vigilance possible in IT-intensive environments, and the increased salience of failure to perform at the expected levels.

Since the late 1990s, the call has been to develop what is being termed the network organization or the virtual corporation (Dwyer, 1994). A common theme is that organizational functions can be performed literally anywhere. In one organization, for example, IT functions are performed in India, while marketing is done in New York. An obvious key is the use of web and related technologies to keep the functions linked. Thus, as the information system becomes the basis for all business transactions, what is necessary to perform the job is not access to a physical office, but access to the network. The employee at the office with no access to the information system is less capable of handling the problem than a remote employee with computer access via a wireless network. In addition, the skills needed in the corporation are not established, defined skills, but new problem-solving skills that change over time. The organization needs to be capable of acquiring these skills whenever and wherever they are necessary. At the same time the implications for organizational trust and long-term effectiveness need to be considered.

Challenges for the new employee and the new manager

The picture of the new organization, which emerges is of a stripped-down, fluid entity with relatively few employees and managers, and with many non-central functions contracted outside the organization. Organizations will probably be focused on developing core competencies while outsourcing business processes that are not deemed to be part of what sets the organization apart from its competition. The rise in global outsourcing has been driven by differential wage scales and the improvement in technology that have made areas of the world once considered remote a part of the integrated global economy. The change in the nature of work, and the perceived lack of core-competency benefits from maintaining manufacturing or clerical, administrative jobs in geographic proximity to senior management, have supported the rapid erosion of manufacturing jobs and increasing job losses in the office sector, while allowing for a growth in the overall economy. Even those employees who remain at the headquarters or central location are unlikely to be co-located or to be performing jobs with set hours. How will they be selected, managed, and evaluated? From the management perspective, competitive advantages will be gained by selecting employees based on their competence, co-ordination of their work, and supporting their commitment to the enterprise (Beer *et al.*, 1985). In addition, the use of CMC will allow

the organization to gather more formal knowledge from employees than in organizations using traditional face-to-face communications. IT thus potentially supports the organization's efforts in gathering knowledge from employees (Griffith *et al.*, 2003). Moreover, under this scenario, outsourcing the job to a remote location does not need to necessarily result in a reduction in the quality and even quantity of the organization's knowledge base.

Under these conditions, organizations have become increasingly wary of hiring full-time employees with a full suite of pension and healthcare benefits. As a result, even many old-economy organizations are retaining fewer employees and giving them more work, rather than bringing in new hires (Zuckerman, 2003). Obviously, employee – and, as well, managerial – trust in the system may be projected to decrease. But to what extent are the likely employee and managerial fears and insecurities realistic? It is important to recognize that if many or most of the scenarios we have described do, in fact, become realities, there will be a substantial loss of jobs outside the creative class. Returning to the news reports with which this discussion began, productivity may continue to rise dramatically while job loss also grows at a heavy rate. What will be the impact upon the economy if a large percentage of the workforce either does not work or works only a few hours or days a week? We are not aware of any widespread discussion or investigation of such possibilities in the management, economics, or social services literatures, or by government, yet even if the prospects are remote – and we do not believe they are – it would appear that attention to them is needed.

Several possibilities exist. First, it is important to note that, as Taylor's (1911) scientific management began to have a major impact upon the early factory system, there were widespread concerns, expressed both by employees and by management, that unemployment would be rampant as efficiencies eliminated the need for as many workers. Wren (1979) describes Taylor himself as answering his critics by calling for the factory system to produce at a much higher rate, and in that way, keeping worker jobs by producing more. Evidently, Taylor was right. The US factory system responded by becoming the most productive in the world, and the impact on unemployment was not at all as was feared. Note, however, that the current situation is somewhat different. Under scientific management, factory jobs remained; they were simply done more efficiently. Thus, for example, if productivity increased by 30 percent under Scientific Management, a corresponding increase in amount produced would absorb any potential job loss. But in the situation described, and after the de-skilling process, the routinized job will not remain at all. GE Medical Services plans to support a digitized hospital that has no paper files, no traditional nurses' stations to maintain records, and no medical records department. In this scenario, there is no time spent on tracking and documenting patient information and human efforts are directed toward patient care (Kalakota and Robinson, 2003). Under this scenario, the clerical jobs in hospitals stand to be completely eliminated. What may remain will be a small number of creative-class jobs to handle exceptions – jobs which are not likely to be ones for which the de-skilled worker could qualify.

Under an optimistic scenario, it is possible that what may evolve, if these changes continue in force, will be a wealthy, highly productive society where the work week and job entail very few hours which are very highly paid. Recall that Bridges (1994) has pointed out that our present concept of the job is recent in origin and developed in response to technological changes during the industrial revolution. Perhaps a new set of changes will cause the concept of the job to again evolve along these lines. Even so, a difficult period of transition could be likely.

Looking forward

This paper has attempted to pull together evidence that a growing number of pressures and forces, all related to the onset of the era of pervasive IT, are impacting the structure of organizations, the nature of both managerial and non-managerial work, and the way the workforce is configured. Much of what we point to is familiar and includes the advent of technology to replace or reduce the number of service-sector jobs such as telephone operators, service station attendants, grocery cashiers, and bank tellers. However, we are concerned that there has been relatively little recognition of how widespread the changes are and what they may imply for the functioning of the future economic system and for the meaning and nature of work itself. Examination and research from cross-disciplinary perspectives may be required.

References

- Adar, A.D. (2002), *Managing Knowledge Workers*, Quorum Books, Westport, CT.
- Anthes, G.H. (2004), "Speak easy", available at: www.computerworld.com/softwaretopics/software/apps/story/0,10801,94271,00.html (accessed 5 October).
- Ashforth, B.E., Kreiner, G.E. and Fugate, M. (2000), "All in a day's work: boundaries and micro role transitions at work", *Academy of Management Review*, Vol. 23, pp. 472-91.
- Beer, M., Spector, B., Lawrence, P., Quinn Mills, D. and Walton, R. (1985), *Human Resource Management: A General Manager's Perspective – Text & Cases*, Free Press, New York, NY.
- Bell, D. (1976), *The Coming of Post-Industrial Society: A Venture in Social Forecasting*, Basic Books, New York, NY.
- Bridges, W. (1994), *Jobshift: How to Prosper in a Workplace without Jobs*, Addison-Wesley, Reading, MA.
- Burns, T. and Stalker, G.M. (1961), *The Management of Innovation*, Tavistock, London.
- Byrne, J. (2000), "Management by web", 28 August, available at: www.businessweek.com/2000/00_35/b3696011.htm (accessed 1 October 2004).
- Coile, R.C.J. (2001), "Impact of the new science of genomics", *Journal of Health Care Management*, Vol. 46 No. 16, pp. 355-65.
- David, P. (1990), "The dynamo and the computer: a historical perspective on the modern productivity paradox", *The American Economic Review*, Vol. 80 No. 2, pp. 355-61.
- Davison, B. (2003), "Management span of control: how wide is too wide?", *Journal of Business Strategy*, Vol. 24 No. 4, pp. 22-30.
- Drucker, P. (1957), *Landmarks of Tomorrow*, Harper & Brothers, New York, NY.
- Drucker, P. (1999), *Beyond the Information Revolution*, Atlantic, Charleston, SC.
- Dwyer, P. (1994), "Tearing up today's organization chart", *Business Week*, 18 November, pp. 80-90.
- Fayol, H. (1916), *Industrial and General Administration*, Dunod, Paris.
- (The) Federal Reserve Board (2003), "Remarks by Governor Ben S. Bernanke before the Bloomberg Panel for the Outlook on the US Economy, New York", available at: www.federalreserve.gov/boarddocs/speeches/2003/200309042/default.htm (accessed 5 September).
- Florida, R. (2002), *The Rise of the Creative Class*, Basic Books, New York, NY.
- Goss, E.P. and Phillips, J.M. (2002), "How IT affects wages: evidence using internet usage as a proxy for IT skills", *Journal of Labor Research*, Vol. 23 No. 3, pp. 463-74.

- Griffith, T., Sawyer, J. and Neale, M. (2003), "Virtualness and knowledge in teams: managing the love triangle of organizations, individuals, and IT", *MIS Quarterly*, Vol. 27 No. 2, pp. 265-87.
- Groschen, E.L. and Potter, S. (2003), "Has structural change contributed to a jobless recovery?", *Current Issues in Economics & Finance*, Vol. 9 No. 8, pp. 1-7.
- Kalakota, R. and Robinson, M. (2003), *From E-Business to E-Services: Why and Why Now?*, Addison-Wesley, New York, NY.
- Malone, T. (2004), *The Future of Work: How the New Order of Business Will Shape Your Organization, Your Management Style and Your Life*, HBS Press, Boston, MA.
- Mintzberg, H. (1998), "Covert leadership: notes on managing professionals", *Harvard Business Review*, Vol. 76 No. 6, pp. 140-7.
- NIST (2002), "What is pervasive computing?", available at: www.nist.gov/pc2000/ (accessed 12 June).
- Piccoli, G. and Ives, B. (2003), "Trust and the unintended effects of behavior control in virtual teams", *MIS Quarterly*, Vol. 27 No. 3, pp. 365-95.
- Rajan, R. and Wulf, J. (2004), "The flattening firm: evidence from panel data on the changing nature of corporate hierarchies", September, available at: www.management.wharton.upenn.edu/wulfresearch/Papers/Flattening_Firm_9_03_v2.pdf (accessed 15 September).
- Roach, S.S. (1998), "No productivity boom for workers", *Issues in Science and Technology*, Vol. 14 No. 4, pp. 49-56.
- Stiroh, K. (2001), *Information Technology and the US Productivity Revival: What Do the Industry Data Say?*, Federal Bank of New York, New York, NY.
- Taylor, F.W. (1911), *Principles of Scientific Management*, Harper, New York, NY.
- Thurrow, L. (1999), *Building Wealth: The New Rules for Individuals, Companies, and Nations in a Knowledge-Based Economy*, HarperCollins Publishers, Philadelphia, PA.
- Uchitelle, L. (2004), "Growth in jobs ground to halt during December", *The New York Times*, 10 January (Section A), p. 1.
- Van Fleet, D.D. (1983), "Span of management research and issues", *Academy of Management Journal*, Vol. 26, pp. 546-52.
- Webopedia (2004), available at: http://e-comm.webopedia.com/TERM/E/electronic_commerce.html (accessed 1 October).
- Wessel, D. (2004), "The future of jobs: new ones arise, wage gap widens", *Wall Street Journal*, 2 April, p. 1.
- Whetton, D.A. and Cameron, K.S. (1998), *Developing Management Skills*, Addison-Wesley, Reading, MA.
- Wirth, A. (1992), *Education and Work for the Year 2000: Choices We Face*, Jossey-Bass, San Francisco, CA.
- Woodward, J. (1965), *Industrial Organization: Theory and Practice*, Oxford University Press, London.
- Wren, D. (1979), *The Evolution of Management Thought*, Wiley, New York, NY.
- Zuboff, S. (1984), *In the Age of the Smart Machine*, Basic Books, New York, NY.
- Zuckerman, M.B. (2003), "So where are all the jobs?", *US News and World Report*, 22 October, p. 86.